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Adult Numeracy and the Totally Pedagogised Society: PIAAC and other international surveys in the context of global educational policy on lifelong learning

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Abstract

This paper aims to discuss the emergence, form and likely effects of international surveys of adults' skills by locating them in the global context of policies on education and Life Long Learning (LLL). It focuses on adults' numeracy and discusses its conceptualisation and assessment in PIAAC (Project for the International Assessment of Adult Competencies), which is the most recent survey. Drawing on critical theoretical resources about new forms of *governance* in education and transformations in the *pedagogic discourse*, the paper further substantiates existing critiques of global policy trends, namely that they are motivated by human capital approaches to education and LLL. In particular, we show that the apparently commonsensical appeal of evaluative instruments like PISA and PIAAC is based on a *competency* model of knowledge, which embodies an exceedingly narrow notion of competence. Relatedly, the notional curricula promoted by such surveys potentially articulate a more radical idea of LLL, captured by Bernstein's conception of *trainability* as the mode of socialisation into a *Totally Pedagogised Society*. The paper presents a dual approach to understanding international adult performance surveys in general – in that, besides deploying the theoretical resources already indicated, it also raises a number of methodological issues relevant to the valid interpretation of these studies' results. Ultimately, it argues for the importance of mobilising resources from critical educational perspectives to support the development of potentially powerful knowledge like numeracy and to prevent its being reduced to a narrow competency.

1 Introduction

This paper focuses on PIAAC, the Project for the International Assessment of Adult Competencies, which completed fieldwork in 2011-12, and reports results in late 2013. It builds on earlier studies, including the International Adult Literacy Survey (IALS, 1994-98), and the Adult Literacy and Lifeskills Survey (ALL, 2004-06). PIAAC focuses on three domains considered basic for adults living and working in globalised industrial and 'knowledge' economies: namely, *literacy*, *numeracy*, and *problem solving in technology-rich environments*. It aims to produce results comparable with earlier surveys, IALS and ALL, but with some crucial developments, discussed below.

PIAAC is linked with the PISA survey of 15-year olds, not only in being sponsored by OECD, but also in using similar definitions of the "skills" measured; it is further expected that the results of the two surveys can be linked to provide data on skills development over the life-course. The project is managed by a consortium of organisations in North America, Europe and Australasia, including for example, Educational Testing Service in the USA, drawing on "expert groups" of academics and educational developers, and survey and educational testing organisations.

Our overall aim in the paper is to discuss the emergence, form and likely effects of international adult skills surveys like PIAAC, so as to support mathematics educators and adult mathematics educators in their attempts to critically appreciate the results of such surveys, and how they are produced[1]. In particular, we aim to show how the use of approaches from the sociology of education can illuminate aspects of what at first sight might appear to be a straightforward method for describing countries' "skills levels".

In recent years, sociologists of education (along with other academics) have studied the development and use of international surveys like PISA and IALS. Such research has broadened sociological approaches to the study of knowledge and power in education, by considering developments in policy and modes of governing, including the role of conceptual apparatuses and categorisation / measurement systems (see Section 2). A number of authors have considered this area from a broadly Foucauldian point of view (see section 3), linking the production of data by international organisations like OECD to new forms of governance and social regulation. In this paper we argue for the need to supplement the macro-level analyses based on such theoretical resources with meso-level analyses of forms of knowledge and practices, enabled by Bernstein's conceptual apparatus. In Section 4, we consider the conceptualisation by PIAAC and related instruments of adult numeracy as "competency", and its effects on the results produced, for example comparisons of skills levels across countries, and also in promoting particular understandings of the concept of adult numeracy.

2 The policy context

2.1 Educational policy in a globalising world

At the current time, educational policy is being developed on a world-wide scale, with supranational organisations being key agencies for change. Some argue that core values in education, such as equality and autonomy, are increasingly displaced, or re-interpreted, through neo-liberal imperatives (e.g. Rizvi & Lingard, 2010).

In this context, the idea of Lifelong Learning (LLL) is central to the conceptualisation and development of "adult numeracy". In international policy debates, LLL has been the focus of much disagreement and divergence, e.g. between "humanistic" and "economistic" approaches (Evans, Wedege, & Yasukawa, 2013) – but here we focus on the view promoted by the OECD, PIAAC's main sponsor. This view aims at promoting the development of knowledge and competencies enabling each citizen to actively participate in various spheres of

[1] Given the experience with earlier studies, the interpretation of PIAAC's published results will likely be highly contested – with the survey sponsors, governments of participating countries, local media, and other groups all striving to promote particular interpretations (see below).

globalised social and economic life. However, this view also holds individuals responsible for their own education (Ball, 2009). This idea further includes the following aspects:

- emphasis on the citizen's need to acquire *and update* a range of abilities, attitudes, knowledge and qualifications over the life-course
- change in the focus of learning "from what people know" to "what they can do" (Moore with Jones, 2007; Beck, 2009)
- weakening of the distinction between formal and informal education, and their inclusion within a broad view of learning.

2.2 The role of international organisations

Increasing globalisation and competitive economic environments are changing the role of national governments in controlling outcomes. In the context of the EU "Lisbon agenda", they aim for *both* social cohesion *and* economic competitiveness, a dualist view known as "inclusive liberalism" (Walker, 2009).

This competitive context leads nations to seek competitive advantage – which is "frequently defined in terms of the quality of national education and training systems judged according to international standards" (Brown, Halsey, Lauder & Wells, 1997, pp. 7-8). Results from surveys like PIAAC (and PISA) can provide such international yardsticks.

For supra-national institutions and agents, the area of Lifelong Learning provides a domain where they can make a legitimate policy intervention, since, in a "globalised" world, in particular in the EU, a focus on labour mobility makes LLL an allegedly supra-national concern. This has provided legitimation for OECD's and EU's actions, and has led to the construction of the "skills and competencies agenda", its promotion as a policy problem in all sectors of education and training, and its conversion into a public issue (Grek, 2010).

More generally, the OECD and the EU are disseminating ideas and practices that strongly influence national policy making around the world. These include:

- the promotion of expertise in creating comparable datasets, so that countries can measure the *relative* success of their education systems and shift policy orientations accordingly (Grek, 2010)
- new forms of "soft governance" of national educational systems, encompassing the production and dissemination of knowledge, the publication of comparative data such as educational and social indicators, and peer reviews involving country and thematic reviews – so that these supra-national organisations are "governing by data" (Mahon & McBride, 2008; Ozga, 2009).

Thus, one of the effects of international studies like PISA and PIAAC is to contribute to a "comparative turn" in educational policy-making, and, more broadly to a scientific – and thus apparently objective and neutral – approach, to political decision-making (Grek, 2010). So, far from being simply descriptive, comparisons perform prescriptive and political functions, driving and justifying changes of an instrumental nature in many countries around the world (Novoa & Yariv-Mashal, 2003).

3 Theoretical resources

A number of social science theoretists have aimed to show how international testing regimes like PISA serve to turn educational phenomena and processes into "calculable" and measurable problems. For example, Gorur (2010) draws on Actor-Network Theory (Latour, 2005) to show how human and non-human entities are involved in assembling scientific facts, and how PISA knowledge comes to be made. Without arguing that numbers are not important, she attempts to make space for a critique of quantification, discussing challenges and limitations in the production of international comparative accounts. In sociological terms, such approaches point to the normative consequences of datasets produced by international agents.

Others such as Lingard (2011), Ozga (2009), and Grek (2010), draw on a broadly Foucauldian perspective, in particular Foucault's (1991) notion of *governmentality* to link developments in education policy formation with an argument about the emergence of new forms of *soft governance*. This alternative form of governing encompasses several key ideas:

- the state governing "at a distance" (i.e. enforcing standards of provision, rather than directly providing key public services) (Rose, 1999)
- marketisation of public services like education (Ball, 2008), and
- audit (Power, 1999).

In addition, central to the supranational agencies' efforts is the project of *identity change*, to shape the subjectivities of all types of "learners" (Rose, 1999; Beck, 1999, 2008; Ball, 2005). This literature suggests that part of what is at stake in education reforms that are a dominant feature of contemporary societies worldwide is to create a compliant workforce that increasingly "governs itself" in desired ways, through acceptance of and involvement in newly created institutional frameworks.

Thus social theorists and researchers point to a move away from a largely state-centric policy production and implementation towards the forming of international policy networks and the utilisation of multiple agencies and agents (Ball, 2012). This form of governing operates across the public/private divide, with new forms of management and through the production of "self-responsibilising" individuals (Rose, 1999). This involves governance by horizontal networks and partnerships of various kinds that operate simultaneously with hierarchical government forms (Beck, 2008; Rizvi & Lingard, 2010).

Bernstein's analysis of the structuring of pedagogic institutions and discourses and his focus on changing forms of educational knowledge and practices can illuminate such shifts, particularly how the advent of a society of skills and "competencies" relates to a *Totally Pedagogised Society* (TPS) (Bernstein, 2000, 2001). In contemporary societies, the state functions in such a way as to ensure that there is less and less space or time left that is not *pedagogised* (Bernstein, 2001). As Rizvi & Lingard (2010) observe, pedagogy has progressively acquired a prominent position in a wide range of public policies, in society and in professional and political practices. The concept of the TPS describes a move towards regulating ever more practices in society so that participation requires showing that one has been trained and evaluated as having the requisite knowledge / skills.

Relatedly, in current educational policy practices, the world of work is seen as translating pedagogically into lifelong learning, which underlies, and legitimises, TPS. *Trainability*, the shaping of particular forms of dispositional and cognitive capacities of social

actors – in particular "the ability to profit from continuous pedagogic reformations", complying as and when required, is the mode of socialisation into TPS. Trainability, as a mode of identity, "erodes commitment, dedications, and coherent time" (Bernstein, 2001, p. 365-66). This is contrasted with specialised identities that "arise out of a particular social order, through relations entered into with other identities of reciprocal recognition, support, mutual legitimation and finally through a negotiated collective purpose" (Bernstein, 2000, p. 59).

Thus, the advent of TPS means that across ever-widening areas of everyday life and occupational contexts, people are being subjected increasingly to pedagogic interventions, e.g. offering families "help" to improve "parenting skills" (Ball, 2009).

Particularly useful in understanding such transformations in education is Bernstein's distinction between two opposing pedagogical models in the process of transmission, acquisition and evaluation of knowledge, namely *competence* and *performance* models. This distinction utilises his basic concepts of *classification* – the extent of boundary maintenance between contents – and *framing* – the degree of control exercised by teachers or students over the selection, organisation, pace and order of knowledge transmitted and acquired in a pedagogic communication (Bernstein, 1971). Also relevant here is his distinction between vertical (esoteric-disciplinary) and horizontal (everyday) forms of knowledge, with their opposing *orientations to meaning* (Bernstein, 2000).

For Bernstein, competence models "are predicated on fundamental 'similar to' relations. Principally, differences between acquirers are not subject to stratification but can be viewed as complementary contributions to the actualisation of a common potential" (Bernstein, 2000, p. 50). Competence pedagogical models derive from social theories of competence which share some fundamental premises: all members of society are inherently competent and all possess common procedures for knowledge acquisition; the subject is active and creative in the construction of a world of meaning and practice; subjects are self-regulating; development is a tacit, invisible act not subject to public regulation; a critical view of hierarchical relations, with an emancipatory flavour; and a shift in temporal perspective to the present tense (Bernstein, 2000). In contrast, "a performance model of pedagogic practice and context places the emphasis upon a specific output of the acquirer, upon a particular text the acquirer is expected to construct and upon the specialised skills necessary to the production of this specific output, text or product" (Bernstein, 2000, p. 44).

The discussion of *competency* by Moore and Jones (Moore with Jones, 2007), drawing on Bernstein (2000), shows how the exceedingly narrow conceptualisation of the concept of competence in dominant educational policy discourses on skills leads to a fragmentation of curriculum objectives, as the skills promoted, flexible or generic, are empty of any disciplinary-based content. What distinguishes competency from earlier understandings of the concept of competence is the fact that competency draws on behaviourist notions of 'performance', while ignoring other traditions of social science research which have more complex (implicit or explicit) definitions of competence.

Several studies have pointed to a shift towards competency modes of knowledge. For example, Moore and Jones (Moore with Jones, 2007), have revealed the structuring principles of the Youth Training pedagogies of the 1990s in the U.K. Further, Beck (2008; see also Beck & Young, 2005) has analysed the policies and discourse of the new "governmental

professionalism" for teachers and other professionals in the public sector. He shows how recent policies in the UK appropriate the discourse of professionalism, by promoting and embodying a competency model of professional formation and training, which "suppresses alternatives" and leads to "coercive reprofessionalisation" (Beck, 2009, pp. 9-10); that is, re-socialisation into closely prescribed behaviours which competent practitioners must display and in relation to which their professional progress is assessed. Such work demonstrates the *analytical* value of Bernstein's descriptions of major shifts in pedagogic discourse in late capitalist societies (Beck, 1999, 2009).

Researchers working with Bernstein's concepts thus argue that the shift to new forms of governing is coupled with a move from competence to "new performance" (competency) pedagogical models (Sarakinioti, Tsatsaroni & Stamelos, 2011); a move also suggested by Ball's (2004, 2008) use of *performativity*, describing the excessive emphasis on performance that is pervasive in current education (or public) policy discourses. Wheelahan (2007) describes the move to skill based learning (a mode of performance pedagogical models, in Bernstein's terms) in Australian vocational education and training (VET) that recast education as an instrument of micro-economic reform. She argues that vocationalism appropriated the language of progressivism to legitimise the displacement of disciplinary knowledge and school subjects in the definition of new curricula – and their replacement by skills allegedly "useful" for certain "realistic" workplace practices. Behind this shift, she argues, is the assumption that it is possible and desirable to identify specific knowledge content "relevant" to work contexts and then go on straightforwardly to teach and assess it. But this ignores the fact that a piece of knowledge can have meaning only within a system of concepts.

FitzSimons (2002) describes changes in the teaching of mathematics, also within Australian VET. She points to a differential positioning of students through the requirement that all workers at lower qualification levels "begin (and frequently end) their vocational mathematics careers with limited, but arbitrary, selections from the number work strand of primary school mathematics curriculum documents". Curriculum writers and mathematics teachers, she reports, were then "given explicit instructions to 'find typical workplace examples' for the predetermined learning outcomes" (p.145).

As Wheelahan, FitzSimons and others have argued, skill-based learning, focusing on specific content rather than on the generative principles underpinning disciplinary knowledge, tends to reinforce class divisions through differentially distributing students' access to the "style of reasoning" represented in disciplinary knowledge. This argument, in contrast to early sociology of the curriculum (Young, 1971), helps us to see the value of the distinction between élite forms of knowledge, namely "knowledge of the powerful" and "powerful forms of knowledge" (Young, 2010): the latter comprises those forms of disciplinary knowledge that have the capacity to enable students to develop a more informed, autonomous understanding of their future professional lives and other roles and duties (Beck, 2009, p. 13, n.5).

This framework of concepts and findings is important for considering the common characteristics of the concept of lifelong learning used around the world: this indicates a move towards a TPS, which affects our understanding of numerate activities, among others (Ball, 2009; Bonal & Rambla, 2003; Evans *et al.*, 2013). Its basic logic is the *de-*

differentiation of educational institutions, so that "historically distinct institutions and activities are becoming more alike" – a logic also evident in the progressive blurring of the boundaries between formal, informal and non-formal education (Young, 2010). Other scholars analysing the on-going restructuring of public sector institutions in many different countries have described the current state as a hybrid combination of marketisation and strong state dirigisme (Whitty, 1997, quoted in Beck, 1999, p229).

However, despite widespread pessimism among commentators from critical theoretical perspectives, we look to alternative programmes to produce counter discourses and studies asserting the value of alternative conceptions of educational knowledge. From within adult education, or what can be called adults' mathematics education (AME) – areas that are sometimes relatively neglected (Evans *et al.*, 2013) – we can illustrate the potential to challenge the currently dominant ideas of numeracy and adult skills. For example, Hoyles, Noss, Kent & Bakker (2010) go beyond a narrow definition of numeracy to develop a richer conception of "Techno-mathematical Literacies" (TmLs), informed by the affordances, flexibilities and demands of information technologies, and document its use by middle ranking UK professionals, in decision-making in specific workplaces. Mullen & Evans (2010) describe demands on citizens' numerate thinking, social supports made available, and the individual learning involved, in coping with the 2007 conversion to the euro in the Slovak Republic. Gelsa Knijnik and her colleagues (e.g. Knijnik, 2007) describe work with the Landless Movement in Brazil, facilitating their learning to recognise, to be able to compare, and to choose appropriately from academic and/or "local" knowledges, in carrying out their everyday practices.

4 The PIAAC Survey

The first cycle of PIAAC involves 25 countries, 19 in the European Union – rather more than earlier cycles of IALS and ALL. Each country has interviewed about 5000 adults, normally defined as 16-65 years of age. The cross-national nature of the project is justified on several grounds (Schleicher, 2008): producing economies of scale across participating countries; providing a comparative perspective for policy-makers; displaying greater variation in adults' situations and results; and allowing monitoring of progress towards international targets, e.g. the EU Lisbon declaration from 2000 and the current "Europe 2020 Strategy"[2].

4.1 Aims of PIAAC and its Precursors

The report on the first cycle of PIAAC's first international precursor, IALS, gave reasons for undertaking that survey, and some insight into the developing aims of international surveys of adults' skills. The production and use of knowledge was seen as important – although:

[2] Information and documents about EU education policy are found on the European Commission website: www.ec.europa.eu/education/focus/focus479_en.htm. (Accessed 23 Dec. 2011).

> … the measurement of knowledge and skills and of their benefits is still imperfect […] . We need to understand the value of competencies […] during different phases of the lifespan, so as to make informed decisions about human capital investment. […] education provides many benefits, including social cohesion … [...] An important indicator in the future will be the rate of adults' engagement in organised education and training, and self-directed learning […]… so as to bring us closer to the Learning Society. (OECD & Statistics Canada, 1995, pp. 5-7)

This early statement acknowledges a *human capital* approach, which focuses on the social "return" from investment in peoples' attainment of qualifications, at all levels of education. The introduction also refers to social benefits like social cohesion, and progress towards "the Learning Society", to be achieved through both "organised education and training" and self-directed learning.

In the late 1990s, PIAAC was commissioned by OECD (while PISA was being developed to assess 15-year olds' readiness for life outside of school). Its wider objectives were presented by Andreas Schleicher (2008) of the Education Directorate at OECD – as helping the participating countries to:

- Identify and measure differences between individuals and across countries in key "competencies"
- Relate measures of skills based on these competencies to a range of economic and social outcomes relevant to participating countries, including *individual outcomes* such as labour market participation and earnings, or participation in further learning and education, and *aggregate outcomes* such as economic growth, or increasing social equity in the labour market
- Assess the performance of education and training systems, and clarify which policy measures might lead to enhancing competencies through the formal educational system – or in the work-place, through incentives addressed at the general population, etc. (pp. 2-3, italics added)

Further, PIAAC is designed to be repeated, in order to build up time series of data for countries repeating their participation. If this can be managed (and financed), this longitudinal aspect aims to facilitate the study over time of the correlations relevant to the analyses implied by these aims.

We can see some continuity between the PIAAC objectives and those enunciated in relation to IALS: they both comprise a "human capital" approach, linked with social concerns. The later objectives for PIAAC appear to be more detailed, and to emphasise more strongly comparisons between countries, presupposing a basically competitive global economic context (Cussó, & D'Amico, 2005; Evans, Wedege & Yasukawa, 2013).

4.2 Conceptualising and Measuring Adults' Numeracy Competencies in PIAAC

In the framework used by OECD, numeracy is one of the three "competencies" which PIAAC aims to measure, in addition to literacy and "problem-solving in technology-rich environments". In the OECD's approach, *competencies* are

> internal mental structures, i.e. abilities, capacities or dispositions embedded in the individual […] Although cognitive skills and the knowledge base are critical elements, it is important not to restrict attention to these components of a competence, but to include other aspects such as motivation and value orientation.
>
> (PIAAC Numeracy Expert Group, 2009, p. 10)[3]

Numeracy is defined for the purposes of designing the items for PIAAC as:

> the ability to access, use, interpret, and communicate mathematical information and ideas, in order to engage in and manage the mathematical demands of a range of situations in adult life.
>
> (PIAAC Numeracy Expert Group, 2009, pp. 20ff)

This is put forward as a basis for conceptualising mathematical thinking in context. However, in order to *operationalise* numeracy, the idea of *numerate behaviour* is developed. It is

> the way a person's numeracy is manifested in the face of situations or contexts which have mathematical elements or carry information of a quantitative nature. […] [I]nferences about a person's numeracy are possible through analysis of *performance* on assessment tasks designed to elicit numerate behaviour.
>
> (PIAAC Numeracy Expert Group, 2009, p10; emphasis added)

This led to specifying the following dimensions of "numerate behaviour" that can be used to guide the construction of assessment tasks:

- *context* (four types): everyday, work, society and community, further learning
- *response* (to mathematical task - three main types): identify / locate / access (information); act on / use; interpret / evaluate.
- *mathematical content* (four main types): quantity and number, dimension and shape, pattern and relationships, data and chance[4].
- *representations* (of mathematical / statistical information): e.g. text, tables, graphs.

Each item can be categorised on these four dimensions, along with its estimated difficulty ("ability level"). This allows those constructing the set of test questions to stipulate the proportions of the items that are from each type of each key dimension (e.g. the proportion of

[3] The reader should refer to this 2009 document, and also to OECD (2012), for more detailed discussion on the conceptual and assessment framework to be used for measuring numeracy in PIAAC. Note that the word used for the singular of 'competencies' in the 2009 document (though not in OECD, 2012) is *competence*, whereas we use *competency* in this paper in order to distinguish this notion from what we have characterised above as a very different notion of 'competence' (which provides meaning to pedagogical models that stand in contrast to performance models).

[4] A number of different classifications of mathematical content needed for adult life have been discussed in the research literature (e.g. Cockcroft Report, 1982; Steen 1990; Gal et al 2005).

"data and chance" items of moderate difficulty) – with the aim of assuring the validity of the overall set of items used in the test (OECD, 2012).

Numerate behaviour is understood not to rely solely on formal school learning, but to be "founded on the activation of enabling factors and processes" – including numeracy-related experience, literacy skills, beliefs and attitudes, and "context / world knowledge" (PIAAC Numeracy Expert Group, 2009, pp. 21ff). Therefore, PIAAC also aims to produce affective and other contextual data that can be related to the respondent's performance. This includes demographic and attitudinal information in a Background Questionnaire, and self-report indicators on the respondent's use of job-related skills at work.

4.3 Survey administration

Adult surveys must be carried out in rather different ways than surveys of schoolchildren. For one thing, they cannot rely on "captive populations" of children during school hours. So PIAAC (like IALS and ALL) combines household survey methods with educational testing methodology.

PIAAC's default method of survey administration is by laptop computer[5], although pencil and paper testing was used in IALS and ALL (and in PISA up to now). While this has a number of consequences for the measurement of numeracy (see next section), it facilitates the use of *adaptive testing*, which aims to assess the "skill level" of the respondent from a few initial responses, and then more appropriate items (in terms of difficulty) can be administered to that person throughout the interview.

5 Discussion

Here we draw on the previous sections to discuss key issues concerning PIAAC. The first subsection focuses on the conceptualisation and measurement of numeracy. The second considers critically the pedagogic discourse of competencies promoted by such international surveys.

5.1 Conceptualisation and measurement of numeracy

Generally, surveys rely on standard criteria in the research design to enhance and to monitor the validity of the measurement and sampling procedures. It is important for mathematics education and adults' mathematics education researchers, teachers and policy makers to be able to consider these, when the results of a survey are presented and discussed. Here we consider the following likely effects of certain design features of the survey, and their realisation in the field:

[5] Respondents are presented with initial tasks; anyone uncomfortable with these takes an alternative pencil-and-paper version.

- the *content validity* of the definitions of numeracy and numerate behaviour
- the *measurement validity* of the items presented, including the administration and scoring procedures
- the *reliability* of the measurement procedures
- the *external validity*, or representativeness, for the national population of interest, of the results produced from the sample.

(See Evans, 1983, for a fuller discussion.)

Content validity refers to the extent to which a measure represents all facets of a given concept. The definition of numeracy used by PIAAC (and, earlier, ALL) is based on the four dimensions of numerate behaviour stipulated (see sec. 4): *context, content, response, representation*[6]. The range of categories within each dimension is specified (see sec. 4.2) – for example, context is categorised as everyday, work, society and community, or further learning. This makes the definition more explicit, and the content validity open to scrutiny. In PIAAC, the proportion of items falling into each category of mathematical content, context, and response is controlled (OECD, 2012, p.40), with the aim of enhancing the validity of the operational definition. Nevertheless, in an international survey, this provides a transnational definition, and one needs to question how well it "fits" adults' lives in any particular country. It is also important to consider in what way it relates to any systematically formulated curriculum for adults (see subsection below). For example, the four types of *context* (everyday, work, society and community, further learning) are *under-specified*: they are rather too general to refer to any actual specific social practice or social context in which a particular respondent might engage, in their everyday life.

What we call here *measurement validity* refers to the extent to which the responses to the set of items administered to a respondent actually capture what the conceptualisation of numeracy specifies; this will depend on the *actual range of items used*. As with most educational assessments, the full set of the items used cannot be made public. Nevertheless, four illustrative items are presented (see Appendix) and discussed briefly below.

Measurement validity also requires procedures designed for the administration of the survey to be standardised in advance across all countries, e.g. design specifications of the laptops and software to be used, and rules for access to calculators and other aids[7]. However, as with any survey, full appreciation of the validity of procedures requires assurance of how these procedures are followed in the field. This is even more crucial when results are compared across countries using different fieldwork teams.

As for *external validity*, which includes the representativeness of the sample for the population of interest, we can scrutinise the sample design for any participating country, and plans to maximise individual agreement to participate in the survey (e.g. through incentives offered to sample recruits). Again, judgments about the effectiveness of the sampling procedures depend on knowledge of actual field practices.

Computer presentation of test items can be expected to enhance the *reliability* of test administration across countries and across interviewers, and also with assuring the use of the

[6] PISA uses a definition of mathematical literacy with a similar structure (OECD, 2010).

[7] Respondents in the first cycle of PIAAC, completed in 2011-12, were supplied with hand held calculators and rulers with metric and imperial scales, for use during the interview.

same standards and practices in marking. But it may lead to concerns about loss of another aspect of *external validity*, namely *ecological validity*, that is whether the setting of the research is representative of those to which one wishes to generalise the results. For example, the on-screen presentation of tasks may not be representative of the settings in which respondents normally carry out tasks involving numeracy, and so may not facilitate their "typical" thinking and behaviour responses. Similar dilemmas arise of course for much educational assessment.

This discussion of issues related to various aspects of the validity of the survey shows the importance of sound research design – and also of the way field work is accomplished. However, a number of key issues in interpreting the uses and effects of the survey go beyond the technical issues around methodological validity. They include the way that the survey's measured scores are *interpreted* or *reconceptualised* in presentations and reports of various interested parties. This aspect is of course not under the complete control of the sponsors: for example, the media and certain national interests have often offered conflicting interpretations of results of PISA and other surveys (*EERJ*, 2012). These processes require an understanding of the policy context and the ideological debates that surround the reception of results in a particular country, as well as the global education policy discourse.

Thus researchers, teachers / practitioners and policy makers need to maintain a healthy scepticism about the way that findings are interpreted. For example an adult's performance score in PIAAC will commonly be related to one of five general "numeracy levels". But as in other national and international surveys, there is debate about use of this simple and one-dimensional characterisation of an adult's numeracy. For example, Gillespie (2004) referring to the first UK Skills for Life survey (a national survey done using a similar methodology) notes: "The findings confirm that for many, being 'at a given level' is not meaningful for the individual, as levels embody predetermined assumptions about progression and relative difficulty" (p. 1). Part of this scepticism flows from the finding that many adults have different "spiky profiles", due to distinctive life experiences (Gillespie, 2004, pp. 4-6). Thus, some adults may find items of type A (say, "data and chance") more difficult than type B items (e.g. "dimension and shape"), and others find the opposite.

Similarly, some policy-makers attempt to stipulate "the minimum level of numeracy needed to cope with the demands of adult life" – but this notion too is questionable. Such generalising claims group together adults with different work, family and social situations – for example, social class, gender and ethnicity – and sometimes assume that the demands on an adult's numeracy are the same across all countries, too.

These sorts of concerns about validity and interpretation are shared by users of all surveys including assessments, especially those that aim to make comparisons across countries, or over time. Nevertheless, such questions must be assessed for any survey, where results aim to inform policy or practice.

The sample of four PIAAC or "PIAAC-like" items in the Appendix were published to represent the more than 50 that might potentially be presented to any PIAAC respondent (OECD, 2012). Like any sample, it cannot represent the full range of combinations of content, context, responses required, and difficulty levels. Nevertheless, it is useful to consider them here in general terms. First, we notice that there are similarities with the items comprising PISA, as discussed by Kanes, Morgan & Tsatsaroni (this issue). For two of the

items, the mathematical contents are framed by Everyday or Work contexts; for the other two, Society and community contexts[8]. They combine realistic images of the problem at hand and school-like test rubrics, providing the questions that need to be answered, presumably by applying the correct mathematical procedures. In reality, in the everyday lives of most adults, tasks such as reading the temperature from a thermometer would not be fundamentally mathematical problems (e.g. Lave, 1988; Evans, 2000). Moreover, making precise calculations (as in sample item 3), making precise readings from the appropriate scale (as in item 2), or detecting changes in a time series graph (as item1) relate to decontextualised representations of adults' social practices, which reinforce the school-like character of the assessment, and hence are likely to limit respondents' thinking about potentially challenging tasks.

Using Bernstein's basic concepts we see that the recontextualisation of mathematical knowledge in the assessment tasks tends to produce educational knowledge that is weakly *classified* but rather strongly *framed*: adults are expected to perform certain actions, e.g. to act upon, to use, to interpret, etc., as implied by the use of *active verbs* in the specification of the responses to tasks (cf. Beck, 2009). As other researchers using Bernstein's analytical tools have shown, such examples typically do not direct the addressee to systems of mathematical meaning ("knowing") but to functional meanings ("doing") (see Section 3; Hassan, 2004; Gellert & Jablonka, 2009) – though Item 4 illustrates a task which is mathematically relatively demanding.

In general terms, such examples are more likely to regulate behaviour – in the sense of directing attention to practical knowledge – than to invite participants to think about the value of using mathematical knowledge and meanings to address the problem (Sarakinioti et al., 2011).

5.2 Curriculum and pedagogy in the discourse of competency

In the preceding subsection we suggested that there are some problematical features in the recontextualisation of mathematical knowledge, as displayed in PIAAC's assessment tasks. First, following Bernstein we can argue that recontextualisation is in essence a process for pedagogising knowledge, i.e. for constructing curricula, here a notional one. The existence of such a "curriculum" is implied in the definition of numeracy and the use of existing classifications of mathematical content (see note 4 above), related to *vertical* discourse. At the same time, this curriculum supposes a connection to a range of everyday, community and work practices –that is, practices related to *horizontal* discourses. Therefore, any such implied curriculum would employ opposing principles for its construction.

Second, further characteristics of the type of "curriculum" and "pedagogy" for adults promoted by PIAAC can be inferred from the *form of knowledge* that sample items take. In section 3, we discussed a globally promoted type of pedagogic discourse whose core is a *competency* model of knowledge (Moore with Jones, 2007). This, in Bernstein's terms, is a *generic* mode of "new performance" pedagogical models, the most distinctive features of

[8] The OECD Framework document indicates that the overall distribution of numeracy items included by contexts was Everyday – 45%, Work – 23%, Society – 25% and Further learning – 7% (OECS, 2012, p.40).

which are "the particular relationship they claim to have with 'everyday life'", and the emphasis on "the skills and competencies supposedly required in a widening range of occupational and other spheres" (Beck, 2009, p. 5; see also Bernstein, 2000).

There is a strong possibility that PIAAC could reinforce this type of pedagogic discourse, and the surveys could tend to work as an exemplary curriculum type which indirectly prescribes what knowledge the adult populations in all societies should value, strive to acquire, and demonstrate. One problem with this kind of curriculum is that curriculum is seen simply as a *technology*, so that a group of experts can simply assemble it, aiming to produce changes in individual experiences, knowledges and competencies in a largely mechanical way (Bernstein, 2001).

Concerning its implied *pedagogy*, a key PIAAC document relates numeracy to a fruitful combination of informal and formal learning (e.g. PIAAC Numeracy Expert Group, 2009, p. 9), thus reinforcing the view that learning in everyday situations and initiation into disciplinary knowledge can be unproblematically conceived as a continuum (but see Muller & Taylor, 1995). However, when we examine the detail of learning within social practices in the life of a particular adult "learner", we often find tensions between what is learned formally, and what is learned informally (Evans et al., 2013).

As argued earlier, the curriculum and pedagogy assumed by the discourse supported by surveys like PIAAC flows from a *decontextualised construction* of the acquirer's everyday practices – an irony in a pedagogic discourse that emphasises the importance of putting mathematics or other disciplinary knowledge in realistic contexts (Moore with Jones, 2007; Cooper & Dunne, 2000). Thus, in stressing relevance it leaves out meaningfulness (Bernstein, 2001). Yet, putting together knowledge that is both relevant and meaningful can never be in the abstract, without consideration of the concrete social and political contexts in which individuals and groups live, and learn and use their knowledge and skills.

Related to this, surveys set standards –in several ways: the standards are set down clearly in definitions, then operationalised in an apparently transparent way, while the results are presented in numerical terms, which reinforces the impression of dependability. Furthermore, such surveys promote generic pedagogic curricula – which, as Beck argues, have a "a capacity to marginalise and even silence competing ideas, precisely by *not* entering into debate with them, but instead by *tacitly* presuming their irrelevance …". It is this that "makes them so invasive *and* so difficult to combat, especially when they are promoted by a powerful and increasingly entrenched ensemble of governmental agencies" (Beck, 2009, p.12; italics in the original).

In Section 3 we referred to sociological accounts showing that the emerging mode of governing has meant the entrenchment of education policy agencies, where powerful transnational organisations like OECD and the EU have assumed leading roles. Crucial in understanding the implications of such knowledge regulation is that the implied curriculum of PIAAC aims at the formation of adults who possess not only the knowledge and competencies prescribed by the "official discourse" of these key players in policy-making, but also the disposition to accept recurrent re-training throughout their lives. This simultaneously strengthens the powers of key agencies against the concerns of other legitimate agents such as scientific societies, professional associations, trade unions and perhaps even national governments.

Finally, the emphasis of the "curriculum" implied in the PIAAC surveys is performative in character. "Performativity is a technology, a culture and a mode of regulation ... that employs judgements, comparisons and displays as means of control, attrition and change. The performances – of individual subjects or organisations – serve as measures of productivity or output, or displays of 'quality', or 'moments' of promotion or inspection. They stand for, encapsulate or represent the worth, quality or value of an individual or organisation within a field of judgement" (Ball, 2004, p. 143). For Ball, following Lyotard, this new "discourse of power" is the emerging form of legitimation for both the production of knowledge and its transmission through education and training. That is to say, it provides an "ethical framework" within which researchers, teachers and students in various contexts of learning are having to work and think about "what they do and who they are" (ibid.). This is why surveys like PIAAC (and PISA) require serious consideration and debate.

6 Conclusions

We have located the PIAAC surveys on numeracy, literacy and problem-solving in technology-rich environments as the latest developments in a series of international surveys in education. We argue that they exemplify a range of concepts that educational researchers have been using to describe recent global trends in education. These include: the idea of a new mode of governing in education (and the public sector); the idea of de-differentiation of education institutions with the weakening of boundaries between e.g. formal and informal education, and between education and the world of work and life experiences; the idea of a performative society providing new spaces for identity formation; and the advent of knowledge as genericism and trainability as the mode of socialisation into the Totally Pedagogised Society (TPS).

The emerging international policy discourse uses a *human capital* approach – in pursuit of economic efficiency, in the context of international competitiveness and *globalisation*. This is only one, from among all of the social scientific perspectives that could be used to understand the world and act in society (Moore with Jones, 2007). We have aimed here to draw out some of the consequences of such policies and approaches to the assessment of adults. Our concern is to maintain a plurality of social science perspectives on educational policy research, so that supranational agencies and their international studies do not monopolise the field of study of adults' knowledge and *competence*.

Our argument has been that PIAAC and surveys like it potentially articulate a more radical idea of Lifelong Learning, captured by the notion of TPS. The curriculum compatible with the PIAAC approach is generic and performance-oriented, aiming at "flexible identities": people, especially the young, must be able to respond to intermittent pedagogies, reforming themselves according to external contingencies (Bernstein, 2000). We have drawn attention to how the employment of the pedagogic mode of generic skills may in fact require that learners are cut off from contexts meaningful to adults functioning in a variety of settings – namely, a basis in a discipline, professional practice or people's lifeworlds. Thus there are dangers in this move from a broad idea of *competence* to *competency*, as we have shown by drawing on the critical education research literature.

There are a number of possible effects of such performance surveys, which may represent "high stakes" for adults and the countries involved. Crucial are the resulting stratifications of forms of knowledge (practical and "relevant" vs. academic and disciplinary), of social groupings and of countries. An obvious negative effect is the pathologisation of countries which do not "perform" to standards – not necessarily by the sponsors, but by sections of the media, political parties, and new educational agencies (e.g. national assessment bodies). A less obvious one, that our theoretical perspective and related research points to, is that the generic mode of knowledge that such international surveys promote may contribute to (and augment) social reproduction of existing divisions and inequalities, rather than help to change and progress towards a learning society. This sounds paradoxical since the emphasis is on Life Long Learning for all, and the value of experiential learning and useful forms of knowledge. However, generic forms of knowledge do not allow people access to the principles of thinking that disciplinary forms of knowledge can provide. Therefore the unequal distribution of generic and disciplinary forms of knowledge may help to reassert the social division between those who are knowledgeable, and can be thoughtful and creative, in mathematics, and those who are destined to fail and/or need constant retraining.

In terms of effects on future adult education research, there is a danger of a narrowing of conceptions such as *numeracy* and *skills* (defined in a prescriptive way), to focus on an ability to respond to problems recontextualised as everyday or work practice (Moore with Jones, 2007). This in turn will have implications for the definition of an "adult learner" used in research, for "numeracy" – and indeed for the notion of *lifelong learning*.

At the same time, we should be clear that international surveys like PIAAC (or PISA or TIMSS) can afford opportunities for further research. Though results are anonymous at individual level, there is some potential for relating performances to *categories of respondents* – using demographic and attitudinal data from the Background Questionnaire, and/or drawing on further information available on numeracy related practices and "use of skills" at work[9].

The international studies may also provide a context for certain types of national studies, e.g. local qualitative studies, to supplement or to probe Background Questionnaire results. And OECD policy is to make available, on their website, datasets from the survey.

From the various branches of social theory / social sciences, we can derive critical resources to help in appreciating developments in adult educational policy, including numeracy issues. These critical resources can help us to rethink relations between "knowledge of the powerful" (elite / "academic"), and "powerful knowledge", as discussed above. Powerful knowledge can empower on a broader social basis, through knowledge located in the disciplines or professional practice. The aim of educational researchers must be to support the development of potentially powerful knowledge, like numeracy, and to prevent its being reduced to a narrow competency.

[9] For examples of research using data from PISA to support "counter-hegemonic" discourses, see Kanes et al. (this issue).

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Appendix. Illustrative Items from PIAAC

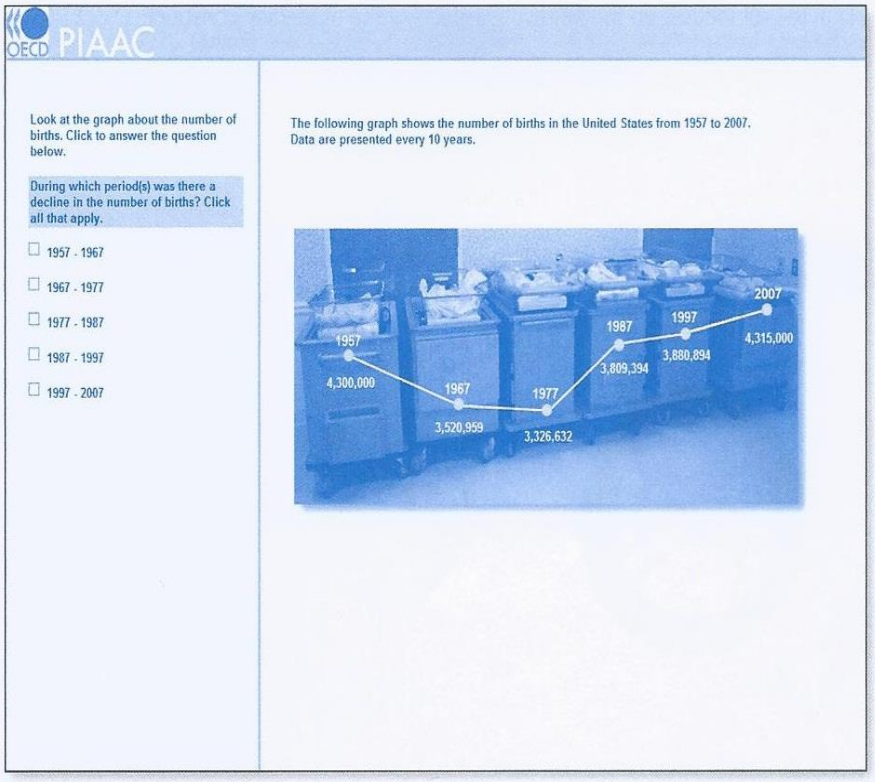
Fig. 1 PIAAC Sample Item 1

Numeracy – Sample Item 1

This sample item (of difficulty level 3) focuses on the following aspects of the numeracy construct:

Content	*Data and chance*
Process	*Interpret, evaluate*
Context	*Community and society*

Respondents are asked to respond by clicking on one or more of the time periods provided in the left pane on the screen.



Correct Response: 1957 - 1967 and 1967 – 1977

Source: OECD (2012, pp. 40-41)

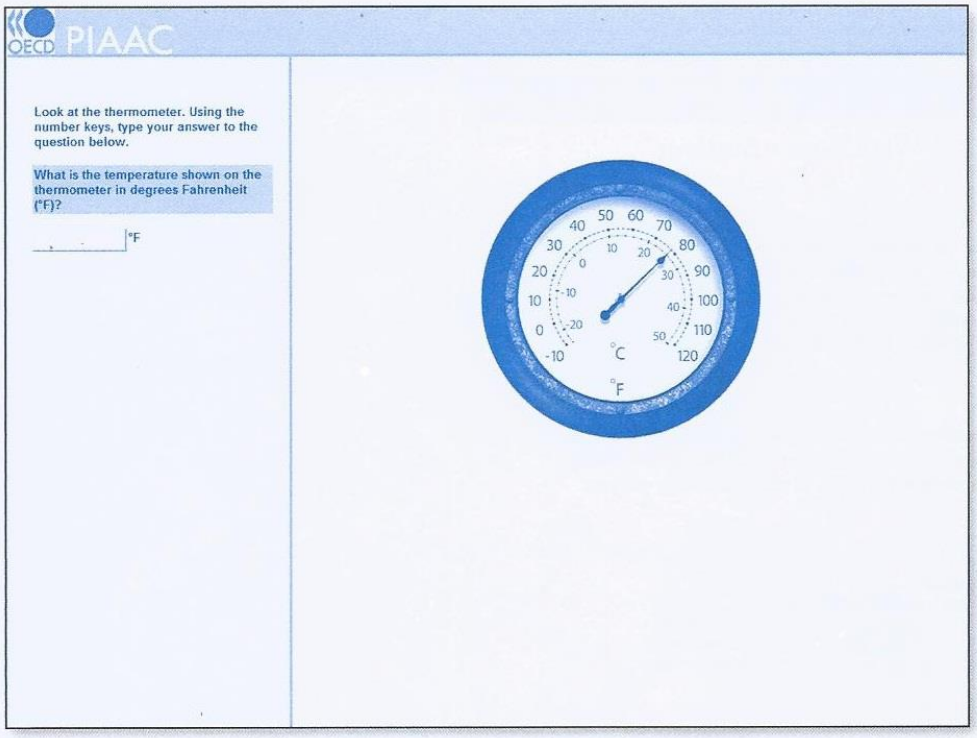
Fig. 2 PIAAC Sample Item 2

Numeracy – Sample Item 2

This sample item (of difficulty level 3) focuses on the following aspects of the numeracy construct:

Content	*Dimension and shape*
Process	*Act upon, use (estimate)*
Context	*Every day or work*

Respondents are asked to type in a numerical response based on the graphic provided.



Correct Response: Any value between 77.7 and 78.3

Source: OECD (2012, p. 41)

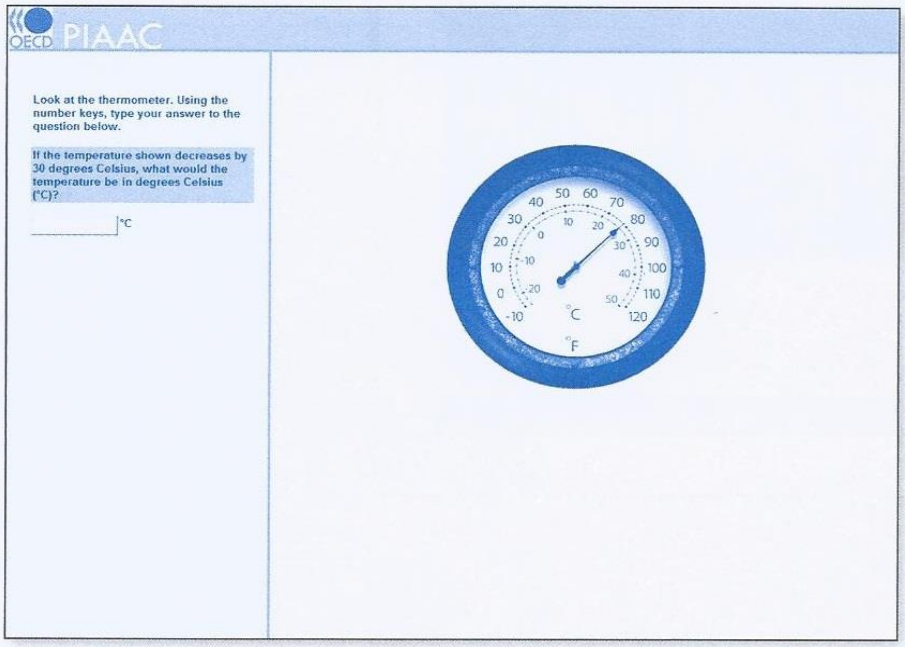
Fig. 3 PIAAC Sample Item 3

Numeracy – Sample Item 3

This third item (of difficulty level 1) in the set focuses on the following aspects of the numeracy construct:

Content	*Dimension and shape*
Process	*Act upon, use (measure)*
Context	*Every day or work*

Respondents are asked to type in a numerical response based on the graphic provided.



Correct Response: Any value between -4 and -5

Source: OECD (2012, p. 42)

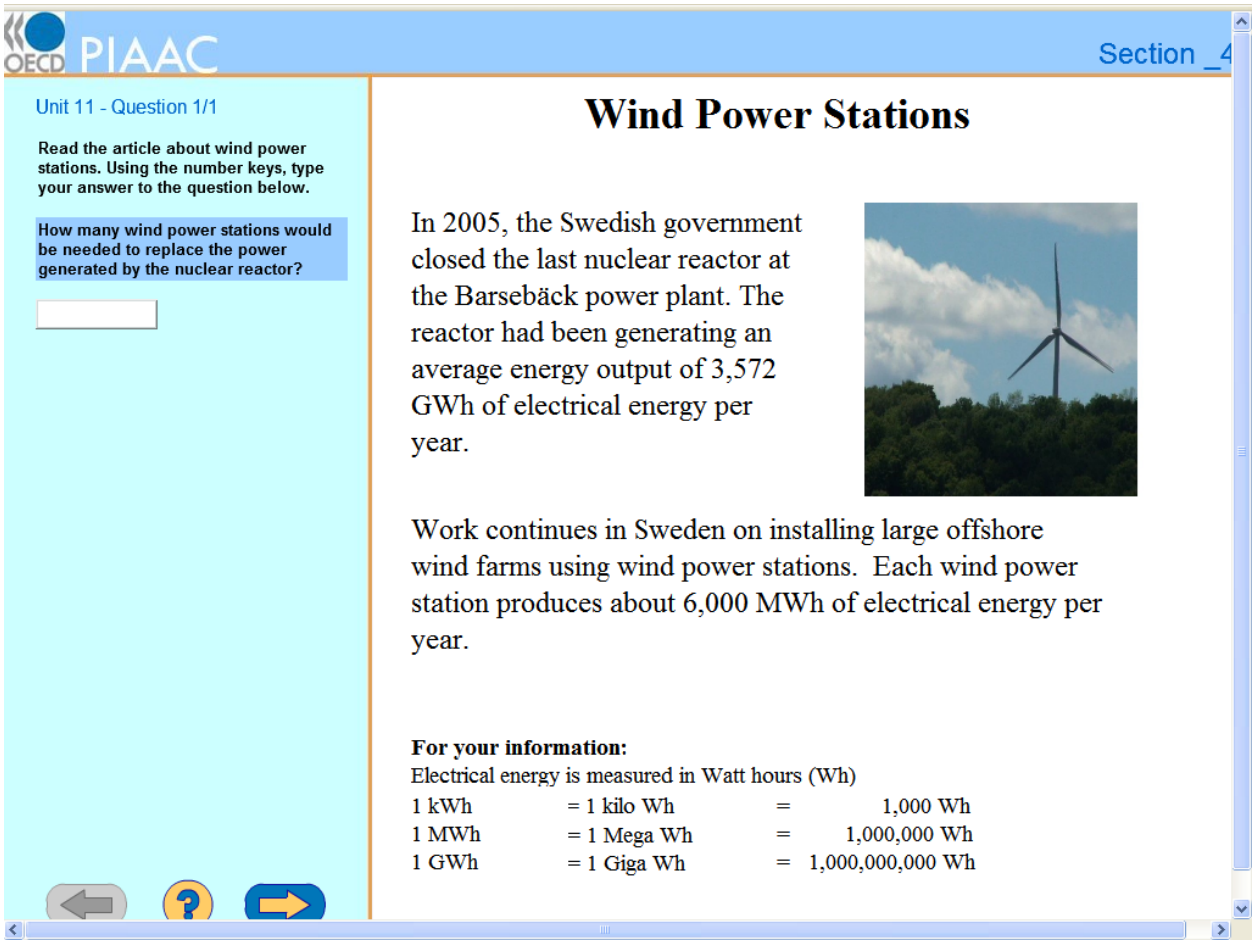
Fig. 4 PIAAC Sample Item 4

Numeracy – Sample Item 4

This sample item (of difficulty level 4) focuses on the following aspects of the numeracy construct:

Content	*Quantity and number*
Process	*Act upon, use (compute)*
Context	*Community and society*

Respondents are asked to type in a numerical response based on the graphic provided.



Correct Response: One of the three values (no values between): 595, 596 or 600.

Source: OECD (2012, p. 42)